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ABSTRACT

America's prairie land is under economic and ecological stress. Acting on the belief that rural schools can help revitalize their communities when schools' activities are related to the places where they are located, schools in Arizona, Kansas, and Nebraska are integrating prairie studies across the K-12 curricula. With the help of area organizations and volunteers, they use the prairie environment for fieldwork, research, service projects, and entrepreneurial activities. Seligman (Arizona) high school students are working with naturalists from Arizona Game and Fish to reintroduce the rare black-footed ferret to the area. This involves monitoring and researching prairie dogs (their prey) and the species on which they depend. Students are also doing community beautification work and writing a history of Seligman. In the Flint Hills (Kansas), workshops familiarize teachers with place-based educational techniques. One workshop alumna instituted a project in which seniors and third graders jointly studied the area's tallgrass prairie ecosystem and cultural traditions. Another has involved his entire high school in research into local water issues. Through creating a community park, a local primary school studied ecology, community history, and folklore. Boone County (Nebraska) students learn and practice environmental stewardship by helping to transform a local nature preserve from ranch land to its pre-agricultural landscape and by monitoring local water supplies. When students participate in the civic life of the community and initiate projects that benefit their families and neighbors, they become more motivated. Adults stop seeing them as problems and start vesting hope in them for the future. (TD)

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Rural Trust Featured Project

Rural Schools on the Prairie Turn to the Land for Learning and Inspiration

By Elizabeth Higgins Null

Rural schools in America's heartland are helping their students to explore, conserve, and respect the natural and human resources of their prairie environment. In this part of the country, people take pride in their ability to survive floods, tornadoes, and other disasters with a mixture of neighborly cooperation and individual self-reliance. More young people move away from prairie towns than move into them, but those who stay develop deep roots and close relationships. Local teenagers say they would gladly settle down at home if they could make a decent living. After college or the armed services, however, they often wind up taking jobs elsewhere.

Today, the prairie is under both economic and ecological stress. The land itself may be threatened by water pollution, erosion, or a depletion of plants and wildlife. When large, laborsaving agricultural operations swallow up smaller farms and ranches, dwindling populations can no longer support services and retailers in nearby towns. If the towns are bypassed by new roads, their business districts and small marketing centers often crumble.

The Rural School and Community Trust (Rural Trust) believes that rural schools can help revitalize their communities when school-related activities bear some relationship to the needs, resources, and the places where they are located. Because of this, it encourages efforts to integrate prairie studies across K-12 curricula at School at the Center (Nebraska), the Land Institute's Matfield Green Consortium for Place-Based Education (Kansas), and the Northern Arizona Rural Trust Cluster. Schools receiving support from these three organizations are using the prairie environment as a scientific laboratory, history book, and source of inspiration for students of all ages. They have enlisted the help of area organizations and volunteers in bringing students out of the classroom for fieldwork, research, service projects, and entrepreneurial activities. When students participate in the civic life of the community and initiate projects that benefit their families and neighbors, they become more motivated. Adults stop seeing them as problems and start vesting hope in them for the future.

The prairie studies programs developed in Seligman, Arizona, the Flint Hills of Kansas, and Albion, Ne-

Children in the Flint Hills area of Kansas learn about the area's history and heritage while exploring the old Fox School on the Tallgrass Prairie National Preserve. Photo: Zilia C. Estrada

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braska illustrate how place-based learning has been implemented in three unique ecological regions. Seligman High School, not far from the southern rim of the Grand Canyon and located just off of historic Route 66, is surrounded by high desert prairie. Chase County School District and the Flint Hills School District are located in a ranching and agricultural area close to the 11,000-acre Tallgrass Prairie National Preserve, recently incorporated into the U.S. National Park system. Albion High School and other schools in Nebraska's Boone County are helping to maintain and restore the Olsen Nature Preserve (ONP), located at the edge of the Sandhills. The Beaver River runs through its former farm and ranchland, about five miles from Albion, which now includes stands of native oak, short bluestem grass, wetlands, and other transitional ecosystems.

Seligman, Arizona

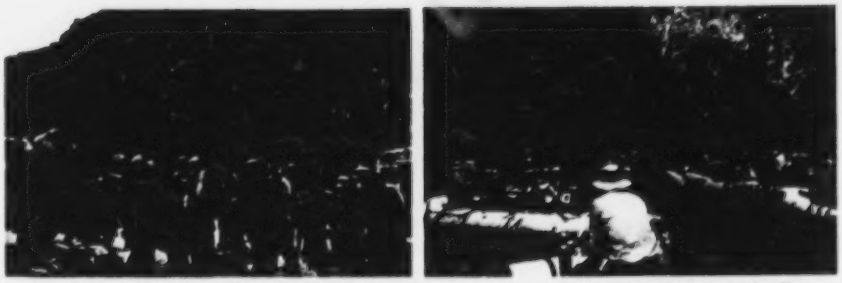
The 62 students at Seligman High School come from families who earn their living, directly and indirectly, from the surrounding land. Several local people work on ranches or cater to visitors drawn to Northwestern Arizona for its scenery, wildlife, and rugged tourist destinations. Consequently, when naturalists from Arizona Game and Fish began collaborating with two science teachers, Bob LaChat and Ross Holmberg, on ways the school could assist in a project to reintroduce the rare black-footed ferret to nearby Aubrey Valley, the teachers knew that students—and indeed most of the community—would respond with enthusiasm. As Bill Van Pelt, the Arizona Game and Fish Department's nongame mammal specialist, says, "The people in the Seligman area are real open-minded, conscious landstewards and see the black-footed ferret reintroduction as beneficial to the ecosystem."

The black-footed ferret, a nocturnal predator who feeds on prairie dogs and lives in their burrows, has traditionally been sacred to local Native-American nations including the Hualapai (whose children sometimes attend Seligman High School) and the Navajo (owners of the 491,000 acre Boquillas Ranch, where the Aubrey Valley is located). Black-footed ferrets, last seen in the area over 70 years ago, were reintroduced to the valley in 1996 from on-site breeding pens. The ferret's ability to reestablish itself as a species is directly related to the health and size of prairie dog complexes on which they depend. Because of a recent, 70 percent decline of Gunnison's prairie dogs (common to the Aubrey Valley), Seligman students have been using Geographic Positioning System (GPS) equipment and maps from the United States Geological Survey to monitor prairie dog habitat and surrounding plant life. They are trying to spot changes in the species on which the prairie dogs depend as well as significant shifts in the balance between both prairie dogs and the ferrets themselves.

After making a systematic inventory of plants in the field, student researchers bring specimens back to the school for further identification and analysis. This painstaking work provides little of the instant gratification that comes from working directly with live animals, but possible contagion limits ferret care (in the wild or in the breeding pens) to only a few, specially-equipped naturalists. Still, the project challenges advanced zoology and botany students. According to Ross Holmberg, "it also motivates kids who just like to get out in a big, flat area."

The endangered black-footed ferret is being introduced to the Aubrey Valley near Seligman, Arizona. Students are researching the relationship among ferrets, prairie dogs, and local flora. Photo: Frosty Taylor, Arizona Game and Fish

While students have been carrying out habitat research, volunteer groups of adults and children occasionally embark from the Seligman school on nighttime expeditions to spot the ferrets themselves. Because ferrets are few and far between, the best way to sight them is by shining a flashlight out across the darkened land. If a small, green, twinkling reflection shines back, the spotter knows he or she has encountered the unforgettable eyes of a black-footed ferret staring back.



Left: Seligman High School students get ready for a three-day raft trip through the nearby Grand Canyon on the Colorado River. Right: Seligman students paddle their rafts down the Colorado River rapids.

In the summer of 2001, about 16 students were rewarded for their work on the ferret project with a raft trip through the Grand Canyon. Although many tourists drive through Seligman on their way to more remote parts of the Canyon, few of the students were familiar with it beyond an occasional trip to the rim. Now they were getting a chance to travel down the Colorado River for three days, camping out on beaches and sandbars along the Grand Canyon's bottom. They started at remote Diamond Creek, on the Hualapai reservation, and finished at Lake Meade. Along the way, they studied the Canyon's geology, history, ecology, and folklore, sharing what they learned in small group presentations.

Holmberg believes that the experience not only had profound intellectual effects on the students, but that it also taught them much about working as a team. Students divided into groups of two or three to handle all aspects of camping, cooking, and cleaning—difficult tasks with minimal equipment and primitive conditions. They also set up and disassembled the boats. Participants who had never been popular in school often excelled at these activities. People had to rely on each other, and those who were the most dependable or best able to cope with crises became recognized group leaders. For many, the river experience rekindled concern for an environment they had previously taken for granted. Some students without previous interest in higher education began to make a connection between land and learning. One recent graduate, for instance, enrolled in a community college to learn about fire science. He is hoping to translate his appreciation of the land into the skills necessary to protect it.

Arizona Game and Fish has approved future plans to work with Seligman High School on an ecological study of one of the headwaters of the Verde River. It is an ambitious project, as students must travel 55 miles to the site every two or three weeks. Their school only meets Mondays through Thursdays. Is there enough flexibility in Seligman's crowded school schedule? Are teachers and students willing to cut back on other academic and extracurricular activities?

As the proposal awaits a final decision from the school board, the K-12 student body, along with teachers and local volunteers, are moving ahead with a school and community beautification program initiated by some of the work done by last summer's industrial arts students. High school civics teacher Sharon Tollivers, assistant teacher, Sharon Fredericks, and an author from Prescott have also engaged civics students in writing a book on their community. Seligman, with its intertwined connections to American transportation history: the Beale Trail, the Santa Fe railroad, the Fred Harvey's tourist empire, and Route 66, is a wellspring of stories and events still in living memory. Students are photographing historical places and interviewing residents who lived around Seligman when Rt. 66 first began.

Beth Packard, director of the Northern Arizona Rural Trust Cluster, believes that the kind of work she sees at Seligman develops broad-based intellec-

tual and vocational skills the area can use and value. She hopes that wherever recent graduates settle down as adults, their decision to go or to remain will depend more on choice than economic survival. She has been a persistent networker, putting schools with strong prairie-based research components in touch with each other and awakening the interest of regional partners such as Arizona Game and Fish.

Flint Hills, Kansas

The teachers in the Flint Hills area of Kansas say that love of the tallgrass prairie is second nature to the people who live there. It has been evoked for a national readership by William Least Heat Moon's "deep map" of Chase County, *PrairyErth*. Several local teachers are enthusiastically working prairie studies into their courses and, they hope, the entire curriculum. For many of them the first step is enrolling in a summer workshop, "Reading the Landscape of Home," organized by Bev Worster, the veteran teacher and community organizer who directs the Land Institute's Rural Community Studies Program. The Land Institute is committed to natural systems agriculture, describing itself as seeking

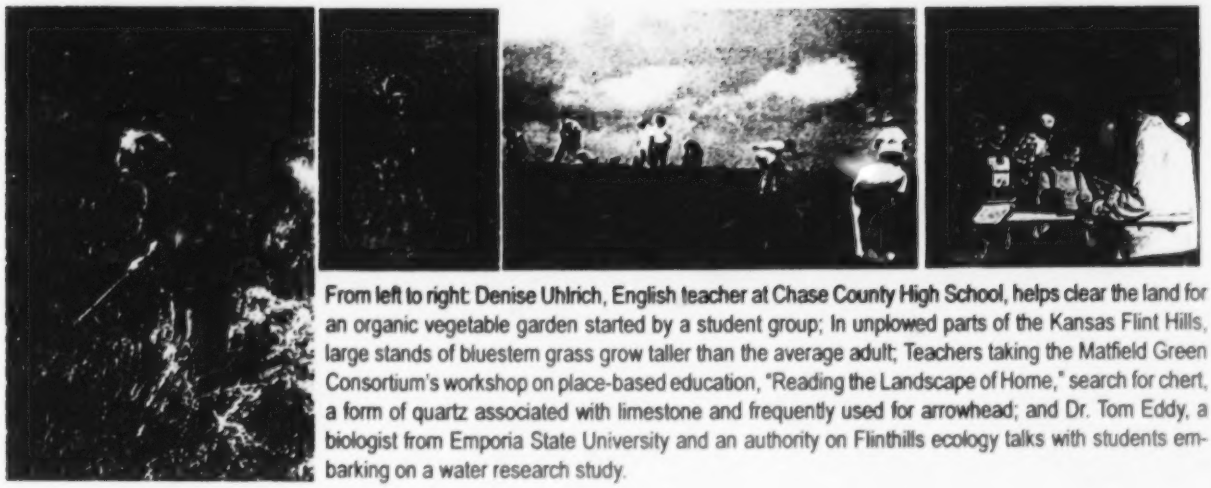
> "to develop an agriculture that will save soil from being lost or poisoned while promoting a community life at once prosperous and enduring."

Although the Land Institute's headquarters are in Salina, it conducts several research, demonstration, and community outreach projects in the Flint Hills hamlet of Matfield Green, where it has restored an old school and several nearby buildings. Matfield Green is the center of its Rural Community Studies Program because the Land Institute believes "we are granted more creativity when thinking about issues within their context." Thus, the Matfield Green Consortium for Place-Based Education (a partnership between the Rural Trust and the Rural Community Studies Program) holds workshops in the middle of the Flint Hills and influences schools, teachers, and residents on an ongoing basis. Worster's "Reading the Landscape of Home" calls on the expertise of scholars from nearby Emporia State University (which co-sponsors the workshop for graduate-level credit) and asks local farmers, entrepreneurs and artists to offer their insights and talents. Each year, the number of teachers with place-based teaching experience grows, and they too return to share their successes and challenges.

Participants learn how to define, locate, survey, and map local watersheds; to study the prairie's ethnobotany, ethnohistory, archaeology, and folklore; to examine, compare, and evaluate soil samples; to establish school-based, entrepreneurial projects in sustainable agriculture; and to integrate arts and literature with prairie studies. Worster herself teaches practical techniques for working across subject disciplines and developing students' journals or portfolios. Young people demonstrate place-based projects, and visiting scholars lead field trips to the nearby prairie with its streams, farms, and ranches. Community members sometimes attend afternoon workshops and host potluck dinners for participants. Teachers who have taken "Reading the Landscape of Home" describe it as "intense," and value the exchanges on stewardship and ways of connecting the classroom to the people and the outdoors.

One workshop alumna, Denise Uhlrich, teaches English at Chase County High School, where her enthusiasm has been contagious. Collaborating with teachers from other subjects, she helped institute the "Tallgrass Project," in which seniors and third graders jointly study the Flint Hills' tallgrass prairie ecosystem and cultural traditions. On field trips, both groups sharpen their observational skills by learning to identify plants, birds, and animal tracks. Older students frequently slip into a leadership role with the younger students, encouraging them and acting as role models.

Interest in the prairie flows back into their classrooms. Uhlrich's senior English class compares local drought and dust storm memories with the poignant reactions of John Steinbeck's characters in *The Grapes of Wrath*. This leads to comparative discussions about how modern droughts affect local corporate and family farms. "One objective," Uhlrich says, "is for the students to discover how much their homeland means to them, and compare it to the



From left to right: Denise Uhlrich, English teacher at Chase County High School, helps clear the land for an organic vegetable garden started by a student group; In unplowed parts of the Kansas Flint Hills, large stands of bluestem grass grow taller than the average adult; Teachers taking the Matfield Green Consortium's workshop on place-based education, "Reading the Landscape of Home," search for chert, a form of quartz associated with limestone and frequently used for arrowhead; and Dr. Tom Eddy, a biologist from Emporia State University and an authority on Flinthills ecology talks with students embarking on a water research study.

love the Joad family feels for their Oklahoma land." Seniors also choose their own examples of prairie literature, reading selections aloud to the third graders. Because both age groups share common fieldwork experiences, a bond develops between them. Older students assist the younger children with journal writing and picture taking. Both groups help each other write poems about what it is like to grow up in the Flint Hills. These poems have been combined with student photographs into a calendar (with the help of art teacher Peggy Lyon) for distribution to the community. Jennifer Lyon, a senior, expresses feelings about nature and family which can be understood by anyone who has ever been a child in her region:

I am from Peggy and Larry
From secluded woodlands.
I am from the Saffordville Methodists
From "excellent work," and "deny it till the end."
I am from rows of beans and alfalfa
From summer parties.
I am from snatching pumpkins
From Sunday dinner.
I am from Christmas morning presents
From sledding across hay fields.
I am from morning runs
From warm nights,
But most of all I am from green farmland and rolling hills.

Seniors also profit from visits to Uhlrich's classroom by Flint Hills' folklife specialist, Dr. James Hoy of Emporia State University's English Department. After they begin to understand that folklore is a resource alive in the present as in the past, Uhlrich has her students read Chaucer's *Canterbury Tales* and use it model for creating descriptions of local characters— often recognizable to at least a few classmates. Soon, they start swapping Chaucerian narratives as Canterbury's pilgrims did long ago. At an annual class outing to a nearby restaurant, students pass the hat and pick up the bill for the storyteller judged "best in class," a custom inspired by Chaucer as well!

Uhlrich collaborates on many other projects with Peggy Lyon, the art teacher. Together with their students, they explore multiple meanings of the concept of "landscape." These range from the idea of wilderness, controlled but unplowed stands of prairie grass, (still locally managed by burning), to farms, lawns, and flower gardens. "You should see what Peggy has done with the kids," Uhlrich exclaims, "She shows them that all art, in a sense, is local. She's had them photographing the land and turning their pictures into greeting cards, and ceramic tiles in high relief...beautiful!"

Recently, Uhlrich helped students start a gardening club, "the Red Hot Prairie Peppers," which is beginning to raise organic vegetables commercially. Their initial plan is to market them to area restau-

Students of all ages are beginning to study the Flint Hills streams and creeks. Photo: Zilia C. Estrada

rants, but in time they hope to encourage the opening of a local grocery store. This is a convenience that the school's town, Cottonwood Falls, currently lacks.

Uhlrich knows that many other teachers at Chase County High School are thinking creatively about the school as a center of community life. It pleases her that the high school is hosting a local coffeehouse once a month for local artists and musicians. "It's a non-classroom way to think about school," she says:

> "We use library chairs and low lights. The kids play. They don't have to sing about prairie things, but they get to know the older musicians who come in— the old rock and rollers, and they learn to respect a lot of local styles."

She adds that a Chase Elementary School music teacher has acquired several fiddles and is teaching his classes to play regional fiddle tunes.

While Ken Fischer, Chase County High School's social studies teacher, has not taken part in Worster's "Reading the Landscape of Home" workshop, he nevertheless embraces its tenets in persuading the whole school to take four days from their regular schedule to study water, a topic of concern to the whole county. Local water issues include a devastating flood along the Cottonwood River in 1998, as well as federal and state legal challenges demanding single pollution standards for agricultural, recreational, and drinking water. Changes to these standards would have a strong economic and environmental impact on the area as well as on the state. The supply of groundwater in subsurface aquifers diminishes even as pollution in stream, ponds, and rivers is increasing.

The high school's water study divided students into six teams of 20 to 25 each, consisting of older and younger students as well as teachers.

For three of the four days, rotating teams took field trips to survey area watersheds, study local aquatic life, and research relevant materials at the historical society. Those staying at school interviewed invited guests such as a meteorologist from Wichita or the manager of a local grain elevator. Some students heard what happened when the Environmental Protection Agency (EPA) closed down a local feed lot— how it affected the lives of local people who have been fattening cattle for market on Flint Hills grasses since pioneer days. Other groups learned how farmers cope with drought and precipitation— rain, ice, and hail. On the fourth day, students completed individual reports and group presentations to be given before a public audience.

The water study did not attempt to be an advocacy program. Rather, it was a serious effort to get at facts behind the issues and to explore the relationship between nature and human activity. Because of this open-minded approach, students and adults, who were affected in diverse ways by local water and its regulation, found they could listen to each other with a spirit of reflection and empathy.

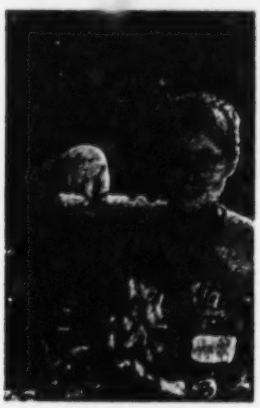
Small prairie-related projects are also incorporated into the life of the Chase County Elementary school in Cottonwood Falls. Working

Frequently, students work in teams as they collect water samples. Photo: Zilia C. Estrada

with a local mason Terry Pretzer, a group of teachers, students, and community volunteers built a wall from indigenous Flint Hills limestone as part of the Kansas Department of Wildlife and Parks sponsored "outdoor wildlife learning site (OWLS)." For this project, the students use local plants to create a habitat for birds and small mammals. A second project to improve the playground was managed by a nine-member student team. The team met regularly with an intern before classes to investigate problems with the sandy, buffering material forming the surface of their school playground. The children studied the contour and location of the playground and investigated ways erosion might be controlled through horticultural landscaping, reshaping of the terrain, and other possible modifications. Eventually, their recommendations were incorporated into a final report presented to the School Board.

Prairie studies projects are also under way in the Flinthills School District. Flinthills High School teacher John Donner is working with his science classes to restore its prairie surroundings. "It can never be natural again," he says, "but we can assist it by reseeding." About a hundred yards from the school, students have developed a good stand of big bluestem and other native grasses. They also are cultivating native wildflowers and conducting monoculture experiments with tall grasses in 6' by 8' boxes. What particularly delights the community is a two- mile nature trail built by students and teachers. Neighbors donated railroad ties and lent trailers, tractors, and post-hole diggers. Shop class students built a bridge, which is almost ready to install.

Another of Donner's most visible projects is the windbreak of 400-500 trees his students planted with the help of a borrowed, ride-on tree planter. They chose the windbreak's assortment of native trees to help mask a major highway and provide shelter for wildlife. Donner, too, has shared his teaching experiences in Bev Worster's "Reading the Landscape of Home." A former upstate New Yorker, he fell in love with the Flint Hills and says he is in awe of its beauty and diversity.



As children sharpen their observation skills, they learn that the landscape of home is filled with treasures. Here, a boy is displaying his latest discovery: a crawdad found in a prairie stream.

Students learn how precious the prairie earth is, what its components are, and how grasses and other local vegetation replenish its nutrients and help prevent erosion. Photo: Zilia C. Estrada

The Flinthills School District's primary school in Cassoday (60 pupils, K-2) is bubbling over with place-based activity. As Rural Trust steward Barbara Poore observed on a recent visit:

> "This school always feels like a family. Teachers and students are very comfortable together, and the community is very active in supporting them."

Working outdoors with and for neighbors comes naturally to a school situated at the heart of community life. On May 24, 2000, the Mayor of Cassoday formally dedicated a community park designed and created by the children with the help of teachers and 24 adult volunteers. Poore describes the project:

> What was once just a weedy lot on the main street is now a park with flowers and butterfly feeders. There is a split rail fence and a picnic table.

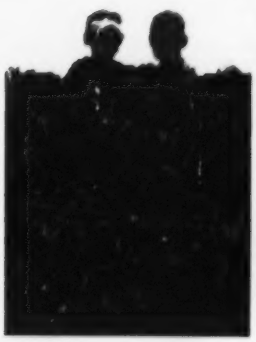
The park is the centerpiece of ongoing studies about ecology, community history, and folklore. Dr. Tom Eddy, an entomologist and botanist from Emporia State University, visited with the children and talked

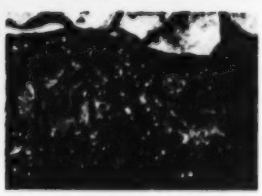
Left: The Flint Hills have numerous outcroppings of limestone and other rocks which are used to build walls and buildings. Right: Albion, Nebraksa is a prairie town of under 2,000 where students are researching some of the ecological issues that affect local communities. Photo: Albion Chamber of Commerce

with them about prairie botany. With the help of one of their teachers, Barbara Anderson, a folksinger and songwriter, they created a musical production, "My Home on the Prairie," featuring what they had learned about plants and soil. The children also maintained a portfolio of drawings, specimens, and information related to their projects.

Lynda Lavne, a reporter for the El Dorado Times, was particularly moved when she discovered hand-made stepping stones for the first time in the park's butterfly garden: each had the little handprint of a boy or girl who had taken part in its creation:

> . . .someday these students will be all grown up. They will kneel down beside the stones with their own children and tell them, 'this is how small my hand was when I made a big difference in my community.' (May 8, 2000)





Clockwise from left: Cassoday Primary School children join adults who helped them in a formal celebration of the park and butterfly garden they created for the community; Each child who took part in the park building project made a handprint on his or her own stepping stone; and All of the students at Chase Elementary School had a hand in building the stone wall for their outdoor wildlife learning center. Photos: Zilia C. Estrada

Boone County, Nebraska

Even before 1996, when the Boone Central Schools of Albion and Petersburg Nebraska (Boone County) received their first Rural Trust grants through School at the Center, students were practicing stewardship of their area's cultural and environmental heritage. These schools have attracted statewide attention by meshing place-based education with other aspects of academic learning, and they are able to make regular use of Olson Nature Preserve (ONP) which is dedicated specifically to regional educational needs.

Students are making a series of wildlife inventories and helping to transform the Preserve's 130 acres from ranch land into a patchwork of diverse and transitional ecosystems reminiscent of its pre-agricultural landscape. The preserve, traversed by the Beaver River, includes sandhills prairie, wetland, lowland grassland, and cottonwoods. For several years, students have mapped and surveyed the area using Global Positioning System (GPS) technology. They have created an online flora database, illustrated by photographs and accompanied by information about distribution, habitat, and time of flowering. Several students began doing this as part of an advanced summer research project, but two of

them, Will Robinson and Jeff Beckwith, persisted through the following year until the database had more than 350 species. "Our goal," said Robinson, "was to get every species of plant that grows on the preserve."

Middle School students recently planted a variety of the wildflower "penstemon" known only in Nebraska. Participants in a summer enrichment program have been monitoring them: "We planted them to try to bring the population back, they are endangered," reported junior high student, D.J. Greger, after visiting a wind-damaged area where they were planted. Two Albion seniors, Patti Krohn and Shelley Howell, became so interested in the Preserve's previous owners that they wrote a biographical article about their lives, "The Legacy of Grant and Berenice Olson", as an independent history project. Younger summer enrichment program students also study history by learning about Native-American life in the area, past and present. Omaha and Sioux once frequented the Preserve, and the Omaha leader, Logan Fontenelle, was slain in the vicinity while hunting elk on horseback. In 2001, Mary Lee Johns, a Lakota, acted as a project consultant and taught the children about Lakota history and cultural traditions. Other Native-American elders have shown participants how to make an 11-pole teepee, to boil liquid in a pig's stomach mounted on a tripod, and to make arrowheads from jasper. As part of these demonstrations, children usually have an opportunity to practice these skills themselves.

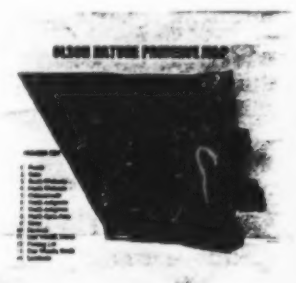
Educators planning Olson Nature Preserve activities make sure the participants enjoy themselves. This is an opportunity for children to take real joy in learning and to treasure the natural world. Fifth graders trap and identify insects but also create and hide bugs created from clothespins. Children seine the river but also run water races. Seventh graders learn to move at will between expressive and objective modes of thinking by writing both poetry and narrative reports.

> The cliff sometimes likes to say things
> That another person has just said
> Which sometimes makes people yell more
> things.

...writes Kyle Young (a junior high student) when describing an echo in his poem, "The Cliff." When reporting on a hike through the same terrain, however, Young deftly qualifies the use of figurative language and separates attribution from direct observation.

> We headed to the wetlands
> where the people who walked in
> there said it felt like a waterbed.
> Then we hiked up to
> the blowout where the oaks were
> buried by sand and looked about
> half as tall as they really were.
> As we were walking we found a
> spittlebug that was surrounded
> in its own spit.

The Prairie Plains Resource Institute (an educational land trust) and an Albion-based board of directors administer the Olson Nature Preserve. The grounds are currently utilized by schools from a five county area as well as by scouting organizations. A local group of "land stewards," including several teachers from Albion and Petersburg, manage the Preserve's grounds. Income from a special fund pays for maintenance and improvements such as the new bridge recently installed across the Beaver River.



Left: Students created a map of Olson Nature Preserve ecosystems using GPS and GIS technology. Right: This photograph of spiderwort (*tradescabtua bracteala*) is part of an online databas of wildflowers, grasses, sedges and trees found at the Olson Nature Preserve. All aspects of the inventory were created by students from Boone Central High School.

Monitoring water along the Beaver River must be done several times a year, in cold weather as well as in warm.

One dedicated steward is Albion High School's science teacher, Mitch Osborn, who helps area teachers combine fieldtrips to the Preserve with course work in their disciplines. In addition to his own science classes, he teaches summer enrichment sessions with other stewards, teachers, and guest instructors. Working with Prairie Plains Research Institute's Mitzi Fox, he taps local and outside experts to conduct teacher-training workshops. He also directs student research projects. One glance at his general biology syllabus shows how frequently his students move back and forth from field to laboratory. Starting off with a study of monarch butterflies, the syllabus quickly moves on to collecting, as well as identifying and classifying, plants and insects. Students ponder the nature of science while completing seed and composting projects. Osborn supplements core content by involving pupils in their own projects and having the entire class participate in biomonitoring activities.

In 1993, Osborn introduced a water quality testing unit into his Advanced Chemistry curriculum. Students learned how to test for nine different aspects of water quality and analyzed the results. Osborn and his students saw that this work could have a direct bearing on the environmental health of their community. With this in mind, Osborn now trains and collaborates with teachers all along Beaver River, which runs from central Wheeler County to the Loup River near Genoa. Students in chemistry, environmental science, and agricultural science classes take part in the project, sharing their observations and posting their results on the Internet. About four times a year, they conduct tests which measure turbidity, dissolved oxygen, biochemical oxygen demand, ph levels, fecal coliform, nitrates, total phosphates, temperature, and total solids.

Annual test results indicate a high concentration of fecal coliform bacteria in portions of the creek running from Petersburg to Genoa. Students attribute this to the high number of cattle feedlots along the river's course. They have concluded that total solids and turbidity indicate serious soil erosion. Osborn's students now monitor ph and nitrates in local wells and are collecting weather data from computerized probes at the Olson Nature Preserve.

In developing biomonitoring projects, Osborn tries to integrate agricultural science with other scientific perspectives while giving his students a chance to use sophisticated technology. He hopes to encourage more understanding of what science can offer farmers, ranchers and others whose livelihood depends on the land. The "Bumble Boosters," a three-year study of bumblebees by Nebraska high school students is designed to do exactly this. Coordinated by the Department of Entomology at the University of Nebraska (Lincoln), it provides 12 partner schools— Boone Central High School in Albion is one— with teaching kits, resources, forms, and computer space for e-mail, news, and collected data. Participating schools collect and analyze data on:

Students have been examining blowout areas of the Olson Nature Preserve and planting it with a rare Nebrasa variety of penstemon.

Children become familiar with the Olson Nature Preserve from primary school on.

bumblebee distribution, abundance, preferred plant species, the effect of excluding pollinators from native habitat and cultivated flora, and the relative attractiveness of artificial nesting domiciles.

Published results will eventually help Nebraskans provide nesting habitats and forage plants for these valuable pollinators. Student researchers also hope to find out if bumblebees can assume the substantial pollinating role of a dwindling honeybee population. Over the last two summers, students from Albion and Newman Grove, working with teachers Mark Seier and Mitch Osborn, collected and identified more than 400 bumblebees from 10 counties, sorting and displaying them by species and county, entering each one in the central database. The students also observed what habitat and plant colors bumblebees seem to prefer and what climate conditions make them most active.

In 2001, Osborn was named the state's outstanding science teacher by the Nebraska chapter of Sigma Xi, the scientific research society. Too energetic to rest on his laurels, he is preparing teachers and students to collect and identify all the types of insects to be found in the Olson Nature Preserve area.

The significant place-based work being done by prairie schools may not provide a comprehensive solution to the problems their communities face. Young people are demonstrating, however, that learning thrives when it connects newly acquired skills to the land and people of home. Best of all, children are discovering, smelling, writing, recording, wading, hauling, measuring, pretending, and comparing. For at least some of them, the prairie is becoming the landscape of challenge and inspiration they hope to live with forever.

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